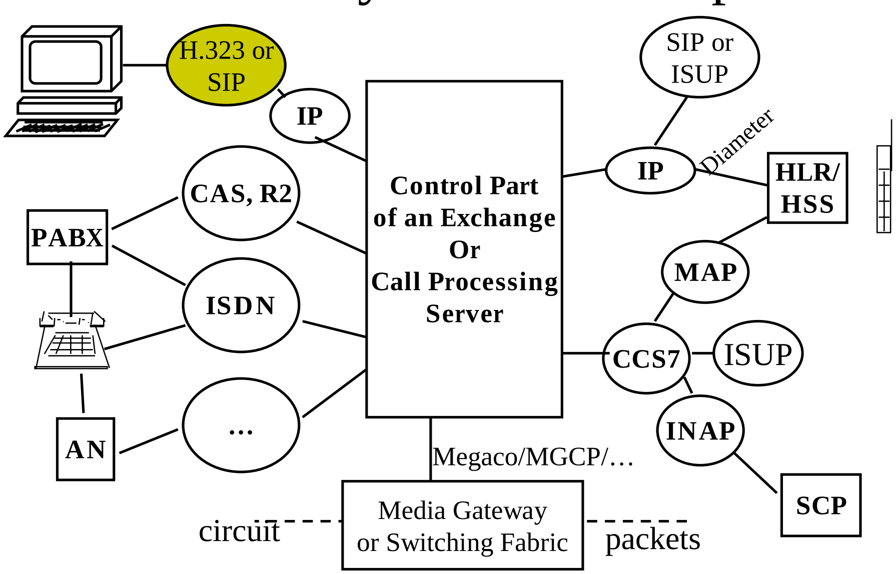
IP Telephony signalling

Overview

H.323

Summary of course scope



Next Generation Network (NGN) is the ETSI effort to harmonize packet telephony

The network architecture is layered in a much more strict sense than in case of CSN

Services
- IP Applications
- Virtual Home Environment
- Open Service Architecture

Control

Network Specific
- call control
- session management
- mobility management

Switching
- Transcoding at the edge
- Switching
- Routing

IP Telephony Signaling alternatives

In Terminals ⟵ Intelligence ⟶ In Network

SIP
- ascii based
- devil in details
- Adopted by 3G
- Bakeoffs drive vendor interopera-bility

H.323
- Inherits ISDN
- complex
- still few services
- Widely used
- first working solution

Megaco/H.248/MGCP
- newest
- seems to be quality spec.
- architecture holds promise
- Interoperability?

SIGTRAN works on ISUP over STCP over IP
- many view this as an interim solution!

H.323 is a key standard for packet based multimedia communication

H.323 over: LANs, Enterprise Area Networks, MANs, Intranets, Internets

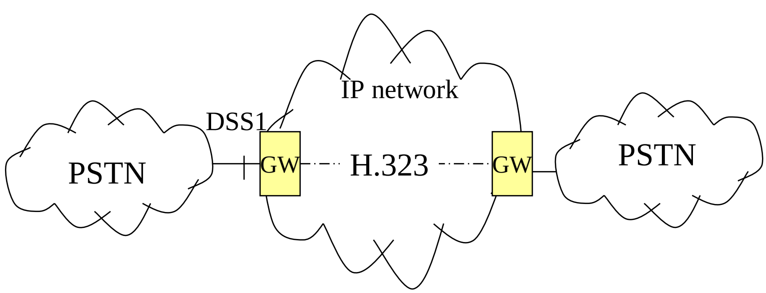
include dial-up connections and PP-connections over CSN/ISDN with PPP packet transport.

Example networks:
- Ethernet (IEEE 802.3)
- Fast Ethernet (IEEE 802.3u)
- FDDI
- Token ring (IEEE 802.5)
- ATM

MM includes:
- Audio (mandatory)
- Video (opt)
- Data (opt)

Communication = conference or two party call.

H.323 is used in IP trunking



IP network is most often an Intranet, not the public Internet.

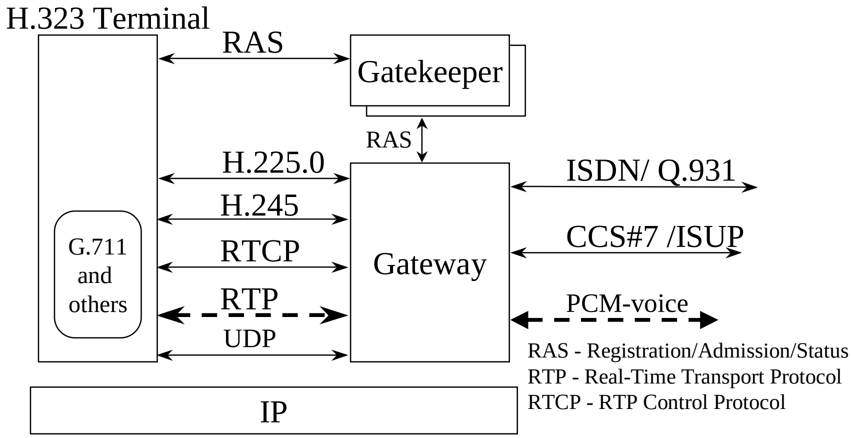
Fall-back to PSTN may be used in case of overloaded IP -network.

Makes use of arbitrage due to the regulated high International PSTN tariffs.

Initially (1997-98) a promising business - now does not look too promising.

H.323 provides also comprehensive conferencing services!

H.323 uses H.225.0, H.245 and RTP

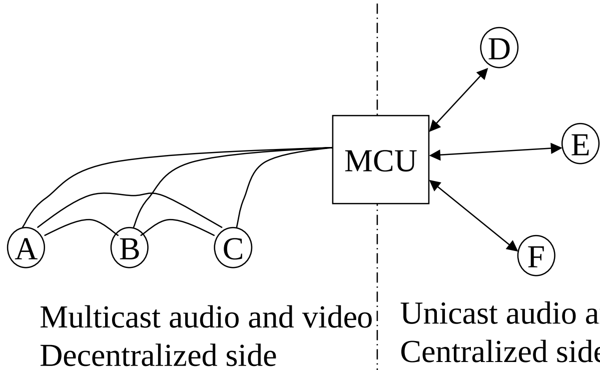


Note: this is an example configuration!

H.323 supports many call modes

- Directly between two H.323 endpoints (no GK)
- Between two H.323 endpoints using a GK
- Many conference types
  - ad hoc multipoint conference (start with 2-party call - expand to conf)
  - broadcast conference (one sender, many receivers)
  - broadcast panel conference (mp conf + bc conf)
  - centralized multipoint conference (trms pp to MCU, MP sends to trms)
  - decentralized multipoint conference (no MCU - all to all coms)
  - hybrid multipoint conference - centralized audio or video
  - mixed multipoint conference (mix of decentralized + centralized modes)

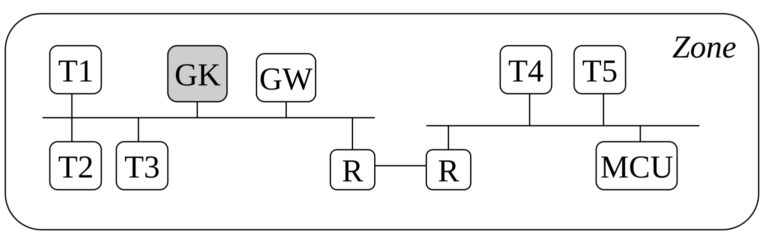
Mixed multipoint conference example



Multicast audio and video
Decentralized side

Unicast audio and video
Centralized side

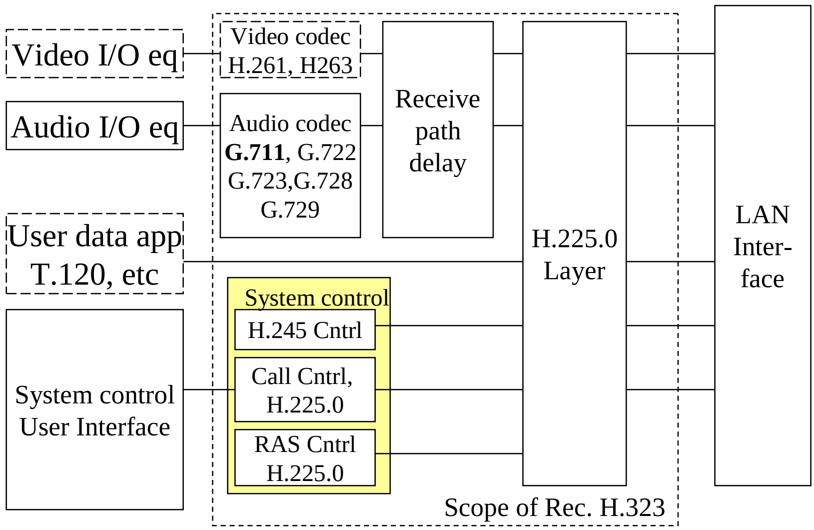
H.323 zone is controlled by a Gatekeeper



- Zone has at least one terminal, MCUs and GWs are optional.
- Zone has one and only one GK.
- Gatekeeper controls access to the network for Ts, GWs and MCUs and provides
  - address translation
  - gateway location
  - bandwidth management

GK control is not enforced, so this is an intranet solution, i.e. all parties engage in cooperation voluntarily.

H.323 terminal equipment



Audio and Video coding

- Audio: G.711 is compulsory (PCM –coding). In practice much more efficient coding methods are used based on negotiation.
- Video: H.261 is compulsory. H.263 (from 1995) is mentioned in H.323. Some H.323v4 products claim support of H.264 (= MPEG4 part 10) video coding.
  - H.264 provides DVD quality at 1.1 Mbit/s, cmp to 3 Mbit/s for MPEG2!
  - H.264 is meant for both IP based broadcast/multicast and videoconferencing.

H.323 supports many parallel addressing methods

- H.323 entity shall have at least one Network Address (e.g. IP address)
- TSAP identifiers allow multiplexing several channels sharing one Network Address - map to TCP/UDP port numbers (source port, destination port).
- An endpoint may have one or many Alias addresses - may represent the Ep or a Conference that the Ep is hosting. Include: E.164 numbers, H.323 IDs (e.g. John Smith), e-mail addresses. Aliases are unique in a zone.

Gateway translates between transmission formats, communication procedures and media formats

- Example: H.225.0 to and from H.221 (transm.f)
- H.245 to and from H.242 (comm procedure)
- Media format: Audio, video, data
- Represents characteristics of network endpoint to SCN endpoint and the reverse. May also work as an MCU
- Can also do call set-up and clearing

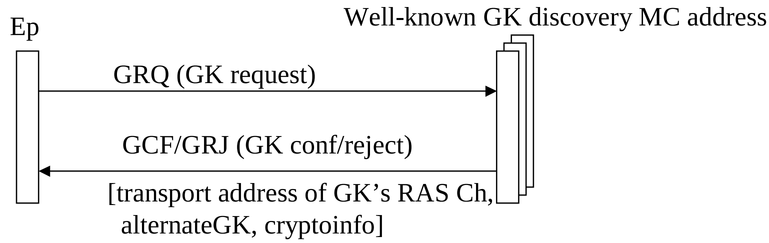
GK provides call control services, when present, shall do:

- Address translation (e.g. alias to transport address using DNS + E.164 to transport address)
  - uses the translation table produced from registration messages
- Admission control: ARQ/ACF/ARJ of H.225.0
  - based on call authorization, bandwidth, other criteria
- Zone management

GK may optionally do

- Call control signalling. May also direct the endpoints to setup call signalling channel between themselves
- Call Authorization using H.225.0 signalling
- Bandwidth management controls the number of simultaneous calls in the zone
- Call management - keep list of calls -> busy conditions
- GK management, Directory service etc -

Endpoint can discover a Gatekeeper automatically



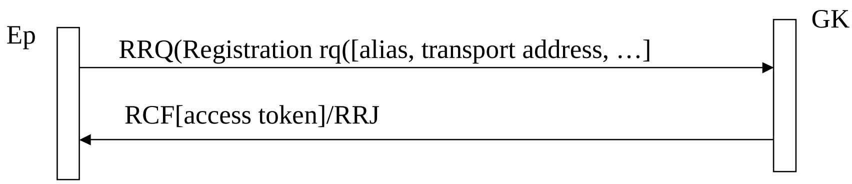
- Automatic discovery eases maintenance of individual terminals
- Terminals may also have the GK id configured

RAS signalling function

Endpoint —— RAS [uses H.225.0 msgs] —— GK

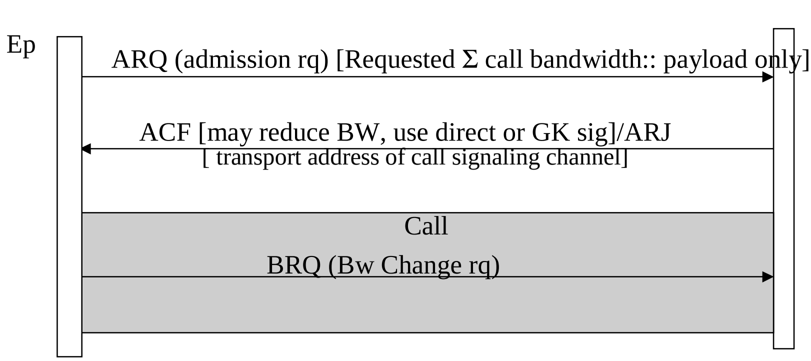
- Performs
  - Registration of endpoints, Admission of calls, Bandwidth changes for calls
  - Status
  - Disengage of endpoints.
- Uses RAS signalling channel =/= call signalling channel and H.245 control channel. GKs have a well def. TSAP id for RAS sig. channel
- Endpoint=H.323 terminal or GW or MCU (is callable)

Endpoints register using GK’s RAS Channel Transport Address prior to any calls are made



- Security policy may require that registration has time-to-live and has to be repeated from time to time.
- Endpoint or GK may un-register using the URQ message.
- The GK maintains an alias to Network Address translation table.
- Access token may be used later in call setup

Call Admission sets the upper limit for the aggregate bitrate of the call



Call signalling uses H.225.0

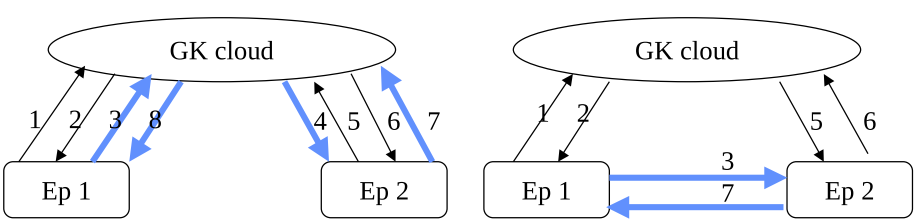
- Call signalling= call setup, request changes in Bw of a call, get status of Ep, disconnect call
- Call signalling is largely inherited from ISDN
- Call Signalling Channel is opened prior to H.245 procedures and prior to any other logical channels between endpoints. Eps have a well known TSAP id for the Call Sig. channel and a well-known Discovery Multicast address.

H.323 Call Signalling Channel Routing

- ACF has the Transport Address of the Call Signalling Channel
- The address is either a GK address or an Endpoint address.

Gatekeeper Routed Call Signalling

Direct Endpoint Call Signalling



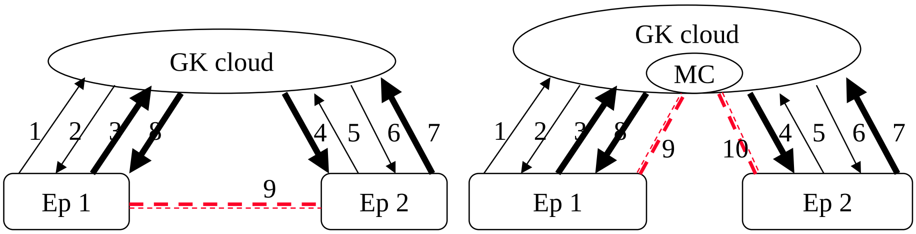
RAS Signalling Channel msgs
Call Signalling Channel msgs

1,5 - ARQ 3,4 - Setup
2,6 - ACF 7,8 - Connect

H.245 Control Channel Routing

The goal of call signalling is the setup/release of H.245 Control Channel!

Direct H.245 Control Channel **GK routed H.245 Control**



RAS Signalling Channel msgs
Call Signalling Channel msgs
H.245 Control Channel

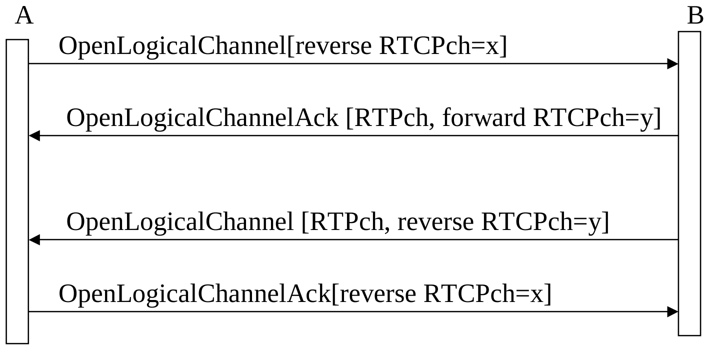
1,5 - ARQ 3,4 - Setup
2,6 - ACF 7,8 - Connect
9,10 - H.245 Channel

H.245 carries end-to-end control messages between H.323 entities

Terminal — H.245 Control Channel — Terminal|GW|MC|GK

- Master/slave determination for conflict resolution
- Capability Exchange (e.g. what codecs are supported)
- Logical Channel Signalling (binds media type, algorithm etc. to ports)
- Bidirectional Logical Channel Signalling
- Close Logical Channel Signalling
- Mode Request (conference modes)
- Round Trip Delay Determination
- Maintenance Loop Signalling
- H.323 also uses flowControlCommand of H.245 to limit bandwidth

Sample H.245 Logical Ch Signalling for two way RTP+RTCP communications setup

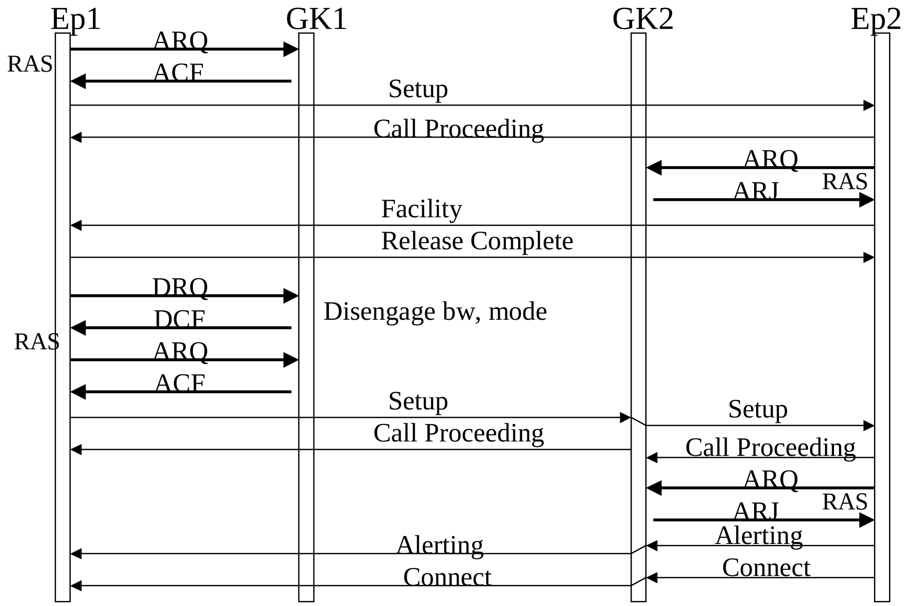


- In IP networks a logical channel corresponds to an IP port number
- Uses H.245 Control Channel

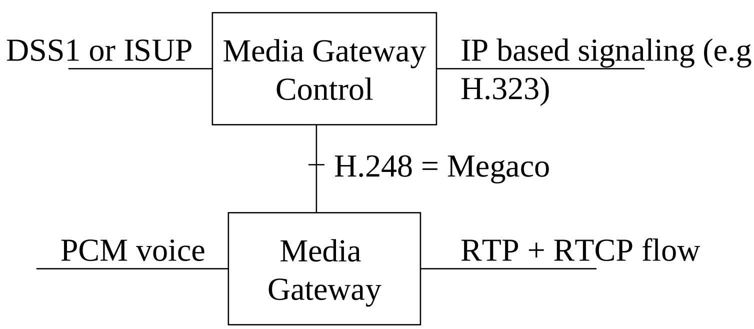
H.323 Call identification uses

- *Call reference value* - between two H.323 entities on a signalling channel (one for call signalling and another for RAS channel
- Call ID - a globally unique non-zero value created by the calling endpoint passed in all H.225 messages
- Conference ID (CID) - in all sub-calls of a conference

Both endpoints registered - Direct/GK-routed call signalling



Gateway decomposition



MG - Trunk gateway, residential gateway etc.
Many MGs can be controlled by one MGC, MGCs can be a mated pair --> higher availability performance.

H.323 summary

- H.323 inherits call signaling from ISDN
- H.323 has many conference modes and many signalling and call routing options
- Call setup delay is reduced by using the Fast Connect Procedure: packs all setup info from both H.225.0 and H.245 into fastStart element in *setup* and *connect* (call proceeding, alerting) messages
- Versions 1, 2, 3 and 4 are available! Version 4 products are available. Supports HTTP based 3rd party service control. ITU-T has version 5 of H.323 (quick browsing did not reveal anything major new stuff …)
- In conferencing applications over IP H.323 is still the leader.
- Version Interoperability and Vendor interoperability are issues!
- More info e.g. in http://www.h323forum.org/